

Applicant(s): Douglas LeCrone, Daniel A. Murphy and Denis Hall
Serial No.: Continuation of 09/344,999 99-035CON
Filed: Herewith

In the Specification

This application is a continuation of co-pending United States Patent Application No. 09/344,999 filed June 25, 1999 entitled Method and Apparatus for Monitoring Update Activity in a Data Storage Facility.

The paragraph at page 1, lines 2 through 6 has been amended as follows:

United States Letters Patent [Application Serial] No. [08/842,953 filed April 25, 1997] 6,101,497 (2000) by Ofek for a METHOD AND APPARATUS FOR INDEPENDENT AND SIMULTANEOUS ACCESS TO A COMMON DATA SET that is assigned to the assignee of the present application and that is incorporated herein by reference.

The paragraph at page 1, lines 7 through 11 has been amended as follows:

United States Letters Patent [Application Serial] No. [09/251,812 filed February 17, 1999] 6,209,002 (2001) by Gagne et al. for a METHOD AND APPARATUS FOR CASCADING DATA THROUGH [MULTIPLE] REDUNDANT DATA STORAGE UNITS is assigned to the assignee of the present application and is incorporated herein by reference.

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The paragraph at page 1, line 20 through page 2 line 14 has been amended as follows:

The above-referenced United States Letters Patent [Application Serial] No. [09/251,812] 6,209,002 discloses a data storage facility for transferring data from a data altering apparatus, such as a production data processing site to a remote data receiving site. The data storage facility includes a first data store for recording each change in the data generated by the data altering apparatus. A register set records each change on a track-by-track basis. A second data store has first and second operating modes. During a first operating mode the second data store becomes a mirror of the first data store. During a second operating mode the second data store ceases to act as a mirror and becomes a source for a transfer of data to the remote data receiving site. Only information that has been altered, i.e., specific tracks that have been altered, are transferred during successive operations in the second operating mode. Commands from the local production site initiate the transfers between the first and second operating modes.

The paragraph at page 3, lines 11 through 17 has been amended as follows:

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Stated differently, assume that a customer wishes to add the cascading feature described in the above-identified United States Letters Patent [Application Serial] No. [09/251,812] 6,209,002. It would be helpful to predict the communications path requirement in advance of installing the cascading feature to avoid overly long updating because the bandwidth is too low or to avoid extra charges because the bandwidth is too high.

The paragraph at page 9, lines 7 through 22 has been amended as follows:

The above-identified United States Letters Patent [Application Serial] No. [08/842,953] 6,101,497 discloses a data processing network that includes a BCV logical volume associated with a data storage facility. Such a BCV/R1 logical volume 34 is included in the first remote site 22. It can comprise any dedicated logical volume within the first remote site 22 preferably on a physical disk drive that is different from the physical disk drive that contains the R2 logical volume 32. This BCV/R1 logical volume 34 can be connected either to the R2 logical volume 32 or to a remote adapter 35. In a first operating mode, the BCV logical volume 34 synchronizes with the R2 logical volume 32. In a second operating mode with the BCV/R1 logical volume 34 attaches to the remote adapter 35 so data will transfer over another

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communications link 36 to a remote adapter 37 in the second remote site 23 for transfer to an R2 logical volume 40 or other data receiver.

The paragraph at page 12, line 15 through page 13, line 2 has been amended as follows:

FIG. 2 depicts the cache 53 as including a device table 54 with a header section and a number of cylinder blocks 56. A single cylinder block 57 is shown in more detail as including a header, and, among other information, an array of sets of protection bits (PB) bits. Two sets PB_{n-1} set 61 and a PB_n set 62 are shown. Each set includes one entry for each cylinder in the logical volume or device; single bits in each set correspond to individual tracks within that cylinder and constitute flags that represent the [stats] status of individual data tracks. In a typical implementation, each PB cylinder entry comprises a sixteen-bit word for providing individual track information for each of fifteen tracks in the cylinder.

The paragraph beginning at page 13, line 14 has been amended as follows:

A configuration table 63 includes a header and volume blocks 64. One such volume block 65 is shown in detail. It

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includes a plurality of volume entries, a volume entry for one volume VOL_i 66 being shown in detail. Each volume entry, such as VOL_i entry 66, includes a listing of all data sets with an identification of the individual tracks assigned to in that data set. Entries 67 and 68 represent entries for two data sets designated Data set_m and Data set_{m+1}. Thus the configuration table 63 provides for any data set or file a list of all tracks that contain that data set or file. With this granularity, it is also possible to combine or integrate the lists to identify all tracks that form a logical volume or device and that $[[;]]$ form a controller, such as the controller comprising the host adapter 25, R1 logical volume 26 and other volumes, the remote adapter 27 and the cache 53 shown in FIG. 1.

The paragraph at page 14, lines 5 through 18 has been amended as follows:

FIG. 3 depicts the operation of the collector application 50 that is initiated by a collector command that identifies the devices (e.g., logical volumes) to be monitored, a cycle time and an identification of a data set 51 shown in FIG. 1. For example, if the host 24 operates under the IBM® MVS operating system the following would constitute the contents of a command that defines a data group set of at least one data group:

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DEVICE_LIST=100-11F,8800-88F

DEVICE_LIST=PL01*,900,910

CYCLE=10

HLQ=TRVW

PALLOC=50

SALLOC=20

VOLSER=EMC200

The paragraph at page 14, line 19 through page 20, line 9 has been amended as follows:

The two lines specifying device lists constitute one approach for specifying the extent of the information to be accumulated. In this example, the identification is in the form of a device list that identifies specific logical volumes. The extent can also be defined by a named group of data sets or logical volumes, such as a SMS_GROUP designation or by listing one or more controllers using their respective serial numbers. The cycle time represents a defined interval over which data is to be accumulated or collected; in this specific example, the cycle time is set to 10 minutes. The remaining lines identify the location of the data set 51 as known in the art. When this particular command is processed, it begins an iterative process with each iteration occurring once per cycle. This process continues until a STOP command is generated. In an MVS

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operating system this can be either a STOP or MODIFY command as
known in the art.